



MARYLAND

Agricultural Experiment Station.

SEVENTH ANNUAL REPORT.

COLLEGE PARK, MD.

1894.

MARYLAND

Agricultural Experiment Station.

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Located on the B. & O. R. R., 8 miles N. of Washington, D. C.

NOTICE.

The bulletins of the Station will be mailed free to any citizen of Maryland who sends his name and address to the station for that purpose.

Correspondents will please notify the Director of changes in their post-office address, or of any failure to receive the bulletins.

ADDRESS,

MARYLAND AGRICULTURAL EXPERIMENT STATION,

COLLEGE PARK, MARYLAND.

College Park, Prince George's County, Md.

January 29th, 1895.

To His Excellency, Frank Brown,

Governor of Maryland :

DEAR SIR :—

In accordance with the provisions of Section No. 3, of Act of Congress, "To Establish Agricultural Experiment Stations, etc." I beg leave to submit my report of the operations of the Maryland Agricultural Experiment Station, for the year ending December 31st, 1894; and also a statement of the receipts and disbursements for the fiscal year ending June 30th, 1894, covering the seventh annual appropriation.

Very respectfully,

ROBT. H. MILLER,

Director.

SEVENTH ANNUAL REPORT
—OF THE—
Maryland Agricultural Experiment Station.
FOR THE YEAR 1894.

REPORT OF THE DIRECTOR.

Station Staff.—The Station Staff has been subject to no change in the past year except in that of assistants.

In April, Professor Whitney, who had been continuing his investigations of the soils of Maryland, was appointed chief of the new division of agricultural soils created in the Department of Agriculture. Although the Station had previously only been able to secure part of Professor Whitney's time and had worked in co-operation with the Weather Bureau, still, with this new appointment, and the enlarged sphere of work, Professor Whitney felt that he could not even give as much time as heretofore to the Maryland State work and sent in his resignation to the Board of Trustees. The board was desirous of having the investigations continued under Professor Whitney's direction, and he was therefore, re-elected with the understanding that an assistant should be appointed and paid out of his salary. Mr. Sothoron Key was appointed as an assistant to work on the soils of Maryland under Professor Whitney's immediate direction. Mr. Key is a graduate of the Maryland Agricultural College of the class of 1894, and Professor Whitney informs me that his work is of an excellent character and entirely satisfactory.

The Secretary of Agriculture very kindly consented to allow Mr. Key to work in the laboratory of the Division of Agricultural Soils, and all the work has been carried on there where ample facilities are provided and where the other workers and the large collection of soils from all over the world offer a very great advantage for the study and comparison of the Maryland soils.

Publications.—During the past year the following publications have been issued:

- Jan. 1894, Sixth Annual Report.
- Feb. 1894, Bulletin No. 24, Special Issue, Composition of Commercial Fertilizers sold in this State.
- March, 1894, Bulletin No. 25, Agricultural and Horticultural Departments. Corn, potatoes, tomatoes, strawberries, grapes, &c.
- June, 1894, Bulletin, No. 26, Tobacco.

August, 1894, Bulletin, No. 27, Special Issue, Composition of Commercial Fertilizers sold in this State.

Sept. 1894, Bulletin, No. 28, Experiments with Wheat and Barley.

Dec. 1894, Bulletin, No. 29. Further Investigations on the Soils of Maryland.

Fairs and Institutes.—With the object of reaching as many farmers throughout the State as possible, and interesting them in the work in progress here, a carefully arranged exhibit of some of the products of the Station was prepared, and taken to six of the principal fairs. Much interest was manifested in this exhibit, and a class of farmers was reached who could not be in any other way.

As one of the good effects resulting, a large number of samples of wheat of different varieties, and also samples of fall barley have been sent out by request to farmers in different parts of the State.

There is an increasing demand each year for members of the Station staff to address farmers' meetings, such as clubs, institutes, granges, and conventions. It is gratifying to note that where these institute meetings have once been inaugurated, there seems a strong desire to continue them from year to year.

Visitors.—There has been a decided increase in the number of visitors at the Station during the past year, many organizations in the State having sent delegations here, ranging from five to fifteen members. In no other way can the work of the Station be so thoroughly comprehended and appreciated as by visiting it, and we shall hope to have the number of those who come to see us steadily increase.

Correspondence and Mailing List.—The fact that the different members of the Station staff are willing and ready at all times to answer any questions relating to their several departments, which it may be in their power to do, seems to be becoming generally known, and as a result the number of such inquiries is constantly increasing, and I may say that we feel that we have many friends scattered throughout the State as evidenced by the kindly letters of appreciation which we are constantly receiving.

About one thousand names have been added to the mailing list during the past year, and nearly all of them are by written requests.

Permanent Improvements.—Among the additions to the equipment of the Station, which have been added in the last year, may be mentioned the following:

A sheep barn, which was built as an extension of the tool shed, mentioned in last year's Report. This extension is 20x24 feet, and is constructed with a view to thorough ventilation and convenience in caring for the stock.

It being necessary to make provision for the storage of water for uses at the Station, a cistern was built in the ground on the hill at the foot of the College building with a storing capacity of ten thousand gallons. This is a very substantial affair with brick walls and arched brick top, and cemented throughout inside, and as the base of the cistern

is seventy-one feet above the level of the Station, it gives an ample head of water for laboratory work, etc.

The roof of the barn and main building have been thoroughly painted; and the chemical laboratory has had the walls repaired and repainted, and additional table and shelf room furnished; the balance of the cellar has been cemented to correspond with the work which had been previously done. Over a mile of fencing has been constructed, and the Station lands are now thoroughly protected from the invasion of outside stock which has been a source of trouble in past years.

I am sorry to have to report that the three tobacco barns, which were built last season and were used for experimental work, were destroyed by fire. The actual loss of the buildings is comparatively light, as most of the work of construction was done with our farm hands; but the fact that the whole season's experimental work in growing and curing was practically thrown away (the tobacco at the time being partially cured) is the largest factor in the case.

Farm Machinery.—The only additions made to the equipment of farm machinery during the past year have been a hay tedder and a spraying outfit. The spraying pump is provided with a double hose, and when mounted in a cart is used very advantageously in applying insecticides and fungicides to potatoes.

Lime.—Very striking results have been obtained from the use of lime. The Station farm from having been entirely without sods, now has fine sets of grass in many fields, and while a light top-dressing of manure has been applied in most instances where grass seed was sown, it is believed that the lime has been the main factor in causing the grass to take.

This action of lime in setting grass has been strikingly demonstrated in the experiment reported in Bulletin No. 25, "The Effect of Lime on Corn." In this experiment there was no manure used either on the corn or the following crop of wheat. The lime after increasing the yield of corn 34 per cent. and the wheat nearly 50 per cent. has given us a beautiful set of grass where it was applied, while there is an utter failure in the corresponding plot where no lime was applied.

These facts speak for themselves, and I feel that I can not urge upon the farmers throughout the State too strongly the great importance of this matter of liming. In the above experiment referred to, and in every instance where it has been applied here at the Station, the amount used has not exceeded twenty bushels to the acre. Many farmers are deterred from the use of lime because of the generally accepted idea that nothing less than 75 or 100 bushels per acre would be sufficient, but this theory is a fallacious one; I have seen equally as good results from an application of 15 bushels of caustic lime evenly distributed as from the larger quantity, this for one rotation of crops at least.

EXPERIMENTAL WORK, AGRICULTURAL DEPARTMENT.

Weather Report.—The season of 1894 has been an abnormal one in many respects, and therefore unfavorable for experimental field work. Unusually warm weather during the latter part of March forced vegeta-

tion forward very rapidly; fruit trees coming out in full bloom, and winter grains making an unusual growth. Following quickly on this came a very severe frost, the temperature on the 28th, dropping down to 16.5°. As a result a large part of the fruit was killed, and in many sections of the State the wheat, which was unusually succulent and tender owing to the rapid growth it had made, was seriously injured by the weakening of the straw. While affecting more or less the varieties seeded at the Station, and causing grave apprehensions at the time, the results at harvest proved that only a few of the varieties had sustained serious injury. The rainfall during the season when vegetation is most in need of moisture, from the middle of June to the middle of August, was only about one half the normal for that period. As a result of this many of our crops, notably potatoes (both the early and the late crop) were very seriously injured, particularly the early ones which were killed off within a few days. This extremely dry weather during the summer months has been very discouraging to those who have sown crimson clover, especially those who made their first attempt with it the season of 1893, and failed owing to the severe drouth of that year.

The following is a summary of the rain-fall for this and preceding years at College Park.

YEARS.	1889	1890	1891	1892	1893	1894
Rain-fall in inches	59.59	32.29	50.55	41.47	36.22	33.20
No. days on which rain fell.....	135	151	128	137	102	

The following table gives a comparison of the rain-fall at College Park, Washington, Baltimore and Cumberland, together with the normal precipitation for those places. Also the normal temperature and the mean temperature for 1894, at the same places.

PLACE OF RECORD.	TEMPERATURE.		RAIN AND SNOW FALL.	
	Normal.	Mean for 1894.	Normal in Inches.	In 1894 Inches.
College Park, Md.....	54.2	54.5	42.22	33.20
Washington, D. C.....	55.0	56.4	44.60	30.85
Baltimore, Md.....	55.3	55.9	44.80	38.32
Cumberland, Md.....	50.8	53.2	33.79	28.12

Drainage.—The working force of the Station farm has been employed at odd times during the past year in completing the system of drainage undertaken two years ago. No tiles have been laid, but a large amount of open ditches have been cut and old ones deepened and widened. The beneficial effects of this drainage is very evident, and by another year we hope to have the work completed.

Tobacco.—The experiments made with tobacco have been, testing different methods of curing; this work has been under the supervision of the chemical department, and will be reported under that division.

Wheat.—The experiments with wheat for the past year have included: Variety tests: the comparative effects of crimson clover and cow-peas as a fallow for wheat; the effect of lime on corn-land wheat (lime having been applied to the previous crop of corn); and a comparative test of the profits of wheat and barley.

In the variety test forty varieties were sown, and while some of them, as has been stated, suffered from the severe freeze in March, the general average of yields was good—the forty varieties averaging 34.47 bushels per acre, and six of them exceeding forty bushels per acre. These leading yields were Currell's Prolific, 45.5; Garfield, 44.2; Valley, 42.9; Fultz, 41.7; Winter Fife, 41; Finley, 40.2.

Potatoes.—The experiments with potatoes for the past season have included the following: Tests of twenty early varieties; hill vs. level culture; deep vs. shallow culture; wide and narrow rows; frequent vs. unfrequent cultivation; Bordeaux mixture for the prevention of the blight; crimson clover as a fallow for potatoes; and the comparative profit of planting different sized whole potatoes, and whole potatoes cut to different sizes.

Corn.—The following tests were made with corn during the season of 1894: Testing proper width of rows where corn is drilled; deep vs. shallow working; drilled vs. checkered; frequent vs. unfrequent working of corn; fertilizer tests, and variety tests.

Barley.—The result of the test with barley as a substitute for wheat, as reported in the September Bulletin, No. 28, indicated for this season at least that the barley was the more profitable crop, the yield was 50.5 bushels to the acre, while that of wheat with the same treatment was 36.7 bushels, the barley bringing about the same price as the wheat on the market. A very much better stand of grass was obtained with the barley, as an additional factor in its favor. We would not advise farmers, however, to go too extensively into the growing of barley until further tests have been made.

Crimson Clover—As has been stated, the past two seasons have been very unfavorable for seeding crimson clover, as a large proportion of the seed sown throughout the State, perished after germinating, for the want of moisture, and a feeling prevails in some localities where it has been quite generally tried, that it is an uncertain crop, from the fact that it is usually sown at a time when hot dry weather is liable to destroy it. Where the expectation is to seed it in corn at the last working,

the aim should be to plant the corn early, that the cultivation of the crop may be completed as early in the season as possible, thus giving the young plants an opportunity of establishing themselves before the hot dry weather commences. Many make the mistake of sowing after the corn has been worked the last time, and more failures result from this than any other cause. The seed should be sowed just ahead of the last working, which should be a very shallow one.

As there has been some complaint of seed failing to germinate, it is a very safe rule to test it before buying. Crimson clover seed being much larger than that of ordinary clover, a greater quantity should be seeded to the acre, particularly as the price of it has been getting lower each year. Fifteen pounds to the acre is little enough to sow. If a nurse crop is used such as rye or barley, it can be seeded the latter part of August or early in September after the corn has been cut off. A light top-dressing of manure will take the place of the nurse crop and protect it from the effects of frost.

Feeding Experiments.—The feeding experiment with steers during the winter of 1893 and 1894 was a repetition of the one conducted the winter of 1892 and 1893, that is comparing the profits of a well balanced with a poorly balanced ration. The third and final test is being made this winter.

A feeding test with pigs was conducted during the past year, the primary object being to ascertain the value of ground wheat as a feed for pigs as compared with other feeds. Four lots of two pigs each were fed: lot 1 on shelled corn; lot 2 on ground rye; lot 3 on ground wheat; and lot 4 on ground wheat and corn in equal quantities. None of the lots were fed to a profit, as with no slop or milk available to act as appetizers, the amount of food consumed was little more than enough for maintenance. The cost of a pound of gain with the lot fed on ground wheat was the least. One fact was very clearly demonstrated in this experiment, that is, that shelled corn is not a suitable feed for young pigs, as the lot fed on it alone, made scarcely any gain in weight.

Sheep.—A small flock of Shropshire sheep (eight ewes and one buck) were purchased the past season of George E. Breck, of Paw Paw, Michigan. These sheep were especially selected for the Station from the flock of J. Bowen Jones, of the Royal Agricultural Society, whose flock stands easily at the head of English breeders. The ewes and buck embrace four different strains of breeding, and are a very handsome lot.

Cooperative Work.—Owing to the great difficulty in finding persons properly qualified who are willing to undertake cooperative work for the Station (referred to in the last Annual Report, that of fertilizer soil tests), this work has not been extended in the last year as it was hoped it would be.

A branch or sub-Station for testing small fruits has been established at Salisbury, Maryland, under the control of Mr. W. F. Allen.—This is under the supervision of the Horticultural Department, and will be more fully explained in the report of that department, which follows.

ROBERT H. MILLER, *Director.*

REPORT FROM THE CHEMICAL DEPARTMENT.

To the Director :

SIR :—There has been but little during the year 1894 that would seem to call for a special or particular report from this department; the general status of the Department of Chemistry being substantially the same as has been indicated in previous reports.

Tobacco Work.—At the beginning of the year there were a number of samples of tobacco, from the fertilizer and variety tests upon this subject, upon which considerable chemical work was necessary in order that the results could be placed in an intelligent form. These chemical analyses have been completed, and the results together with those of two years, making in all the results for three years, have been compiled, published and distributed as bulletins of the Station. The results of the field work with varieties, curing and fertilizer, together with a summary of the chemical investigations, were published as Bulletin, No. 26, which made about forty pages. The chemical work in many of its parts were necessarily quite technical, and in lieu thereof, it was deemed best not to burden the general bulletin with the details of this work, but to publish only the summary and practical applications of the results in the general form. The details of this work, making twenty-five printed pages, were presented in a paper read before the Society for the Promotion of Agricultural Science, and has been published in full in the proceedings of that body. We have procured five hundred excerpts of this paper and issued it as an appendix to Bulletin No. 26. These excerpts have been distributed quite generally throughout the tobacco sections of the State. These results in detail have developed many interesting and practical facts. A very notable one of which is that potash salts have the power of influencing quality in a marked degree, even though the yield may be but slightly effected. The experiments outlined on tobacco for the season of 1894 were concentrated on curing, and a test of the effect of the best potash salts upon quality. The growing season though very unfavorable, yet produced a very fair growth, and it is believed some valuable results would have been procured had not the entire crop been lost, when but partially cured, through the misfortunate burning of our tobacco barns. This work will in all probability be repeated the coming year with some modifications, improvements and extensions.

Meteorological Data.—As heretofore, the meteorological data as far as kept at this place has been in charge of this department. It has been my aim to give more substantial aid to the State and the United States Weather Bureaus than in previous years by making monthly instead of annual reports, and, also, as far as possible to contribute to the weekly crop reports. I believe that much mutual benefit would accrue from a still further union of efforts on meteorological lines, and I would recommend that something be done looking toward a better equipment for this purpose and the developing the newer lines of work. A summary of this year's data is appended herewith.

Co-operative Chemical Work—As “Reporter on Food and Feed Stuff” for the Association of Official Agricultural Chemists and in continuance of the policy of former years I have devoted some considerable time to study of methods of analysis. My report for 1894 has been printed in the proceedings of the above named association. I have been continued as “Reporter on Food and Feed Stuff” for the coming year. In this capacity I have made a special effort to improve our methods of analyses of cattle foods so that the results would be more tangible and give a better and clearer idea of the real value of food ; especially of the carbohydrate compounds.

Dairy Experiments.—During the past month I have made a special arrangement by which we could have the use of the College herd of cows for some experiments in feeding for the production of milk and butter. The results while so far are not of such a character as to warrant any facts or figures, yet they give indication of some value and warrant further investigation. The facilities for this class of work are very inadequate and unsatisfactory, and owing to the already great and constantly growing demand for this class of work and also due to the possibilities and future of the dairy industry in this State, I earnestly recommend that some steps be taken toward obtaining the proper and necessary facilities. I believe that through the proper co-operation of College and Station on this line of work that we can procure a good start in this line and very materially aid in developing the industry which is destined to soon stand second among the farming industries of this State, with regard to the value of its products.

Farmers' Meetings.—During the year, as in previous years, I have attended a number of farmers' meetings, institutes, clubs, granges, etc., and given talks on subjects relative to farm operations. It has always been the aim in these talks to show how chemistry was helping to solve the whys and wherefores that confronted the farmer, and to show in a practical way how the latest results of research could be applied to the every day operations of the farm. These meetings draw upon my time to a marked degree, and break in upon the home work considerably: yet I believe it is time well spent, as we are enabled by such methods to get our results before the farmer in the most intelligible form, and at the same time find out what the farmers are thinking about and what questions are of most interest to them, and should demand our attention in Station work.

New Experiments.—Questions related to fertilizers, as to the means for maintaining fertility and the restoration of worn out soils, always meet with a hearty reception and creates a lively interest. In order to help solve some of these questions and get at some facts that most often confront our farmers, I have planned special phosphoric acid and lime experiments so as to meet the exigencies of our conditions. These experiments have been approved by you, and it is hoped that we may be able to get them started the coming spring, but of course it will take several years before many conclusions of real value can be drawn.

The Laboratory.—During the summer the laboratory has been thoroughly repaired and repainted. More table accommodation and shelf room have been added. The storage cellar under the laboratory has been thoroughly renovated, and the floor drained and cemented. Shelves have been put up around the entire wall space, which now furnishes ample accommodations for the storage of acids, glassware, etc., in a safe and convenient manner. On the whole the laboratory is in better shape than at any previous time, but new lines of work and changes in methods, etc., will soon necessitate material additions to apparatus, etc.

Thanking you for the courtesies and support which you have given me and my department in this work, I am

Yours respectfully,

H. J. PATTERSON,

Chemist.

Dec. 31st, 1894.

METEOROLOGICAL SUMMARY FOR 1894.

Temperature in Degrees—Fahrenheit.

MONTH.	TEMPERATURES.—MEAN.					Extreme Maximum.	Extreme Minimum.
	Pre- cipita- tion. Inches	Daily Mean.	Maxi- mum.	Mini- mum.	Daily Range	Record and Date.	Record and Date.
January	2.06	36.6	45.7	28.7	17.0	57-14th	13-28th
February	3.86	34.1	42.6	27.5	15.1	59-19th	14-25th
March	1.27	46.7	57.9	35.9	22.0	81.5-22nd	16.5-28th
April	3.16	51.6	63.0	40.8	22.2	81.5-28th	24-3rd
May	3.90	63.8	74.0	53.4	20.6	86.5-2nd	38.5-29th
June	1.81	72.8	85.0	58.2	26.8	99-24th	45-7 & 15th
July	2.86	75.8	90.0	60.0	30.0	100-13th	49-10 & 11
August	3.56	70.8	83.6	60.6	23.0	96-23rd	50-22nd
September	1.65	67.6	80.7	59.0	21.7	96-10th	44-26th
October	3.61	55.0	66.8	45.1	21.7	84-3rd	29-10th
November	1.60	41.1	52.7	32.1	20.6	70-2nd	16-29th
December	3.86	37.7	48.5	28.7	19.8	56-6th & 21st	11- —
Yearly	33.20	54.5	65.9	44.2	21.7	100	11

REPORT OF THE DEPARTMENT OF HORTICULTURE.

To Robert H. Miller, Director :

SIR:—I herewith have the honor to report on the character and extent of the work of this division for the year 1894.

Distribution of Seeds.—At the request of the Agricultural Department, that the Station would furnish the names of farmers in different sections of the State who would be likely to take an interest in the experimentation as to adaptation and economic value of different varieties of forage plants and garden vegetables, and report through the Station the results to the Department. A circular letter in the early spring was addressed together with a list of the different varieties of seed the Department was prepared to distribute to a number of individual farmers and farmer organizations. Lists of those signifying a willingness to cooperate in the enterprise of the introduction of new or valuable plants were furnished to the Department. Circular letters of inquiry have been mailed to those whose names were furnished by the Station, and it is hoped that the information thus gathered will be of practical value. I desire to acknowledge for the Station the receipt of a package of seed from the Agricultural Department containing not only a number of varieties of forage plants, but some choice strains of garden seed as well; amongst the former I would mention Melilotis Alba, Kafir, Jerusalem Corns, Hog and Golden Milletts, and the unknown Cow Pea. The package of garden seed included varieties of beets, beans, onions, parsnips, carrots, lettuce, radish, cauliflower, Kansas stock and Kentucky Wonder watermelons. The land was put in fine order and the seed carefully planted. Of all the seed received the stand was excellent and the yield of the different varieties exceptionally good. I make this statement because seed from several of these packages were furnished others for trial who have complained of their failure to get a stand, and to emphasize the necessity of properly firming the land when sowing delicate seed as a guard against disappointment.

Experimental Orchard.—This orchard planted by my predecessor, had been well provided with the choicest varieties of apples, peaches, pears, plums and cherries. With the exception of the cherries, the trees have made fine growth, and in the early spring from the abundance and apparent vigor of buds gave promise of an abundant harvest. The cold spell of the 26th of March which proved so disastrous to the fruit yield of the State generally, resulted in an entire miss of the apple crop, small yield of peaches and plums, but from the pear orchard we had some very fine specimens.

Small Fruits.—The growing of small fruits for market purposes has been for a number of years an important item among the industries of the State. The interest in them and the acreage devoted to their culture increases year by year. In addition to supplying near markets, quantities of these fruits are shipped to distant markets of other states, reaching them in advance of their own local supply, and from the prices

obtained under these circumstances ought to be remunerative to those growing them. A pressing need of this large interest is a State Horticultural Association through which cooperative effort would inure to the benefit of those interested. In the growing of small fruits in the State, the strawberry has received, relatively, very much the largest share of attention, and consequently at the Station we have given it corresponding preference. We had in bearing the past season ninety-five different varieties and twenty different plots for fertilizer experiments. The line of experimentation, as arranged in regard to varieties, was for the purpose of ascertaining their relative values, as to earliness, productiveness, shipping qualities and secondary effects of pollination. In regard to the fertilizers, as to the economic value of the application of different plant foods and of different combinations of them and of the application of fertilizers at different times. Additional plantings of varieties were made in April, 1894, and we expect to have in fruitage the season of 1895 one hundred and forty varieties.

Variety Test of Strawberries and Fertilizer Experiments on the Eastern Shore of Maryland.—In view of the importance of this item of horticultural interest in the State, and with a knowledge that the value of varieties is often dependent upon the facts of soil and location, we were prepared to consider favorably a petition signed by many of the largest small-fruit growers of the eastern section of the State asking that experiments with small-fruits be conducted in that section on lines similar to those arranged at the Station and under the direction of the Station.

An arrangement therefore was entered into with Mr. W. F. Allen, of Wicomico county, to make a test of fifty leading varieties of strawberries, and also to conduct fertilizer tests with them as directed, the Station to furnish the fertilizers. The formulas were made up so as to give a study of the effects of the different plant foods and their combinations upon the production of vine and fruit and to obtain a knowledge as to the fertilizers best adapted to the specific needs of this class of plants on the typical soils of that section, and were prepared by Prof. Patterson, Chemist of the Station. The fertilizers according to these formulas were made under the direction of the Station, and sent to Mr. Allen. The plots for this variety test and fertilizer experiment were laid out, fertilizers applied and plants set the spring of 1894 according to the plan stipulated in the contract with Mr. Allen. Early the coming spring the fertilizers to be used as an experiment in top-dressing will be furnished by the Station with directions as to their application. The facts and information gathered from this experiment will be given in full in the strawberry bulletin of 1895. We confidently anticipate that the information derived from this experiment on soils entirely dissimilar in physical character from those at the Station will warrant the granting of the request of the intelligent growers who asked this appointment, and that the facts gathered will prove of value to those interested in the growing of this important market crop in many sections of the State, as we think

the soils of this locality more nearly typical of the soils generally devoted to this crop than are the lands at the Station.

Grapes.—The number of varieties in the vineyard has been increased by additional plantings, and there is now on the list one hundred and ten varieties. In the trial plots we have a number of the different varieties of currants, gooseberries, blackberries, red and black raspberries. Experiments with these have been conducted on a similar plan as that outlined in the treatment of the strawberry. Experiments have been made with the leading varieties of garden vegetables. Specimens of the fruits and vegetables grown were exhibited at the different agricultural fairs whenever it was practical to do so. The interest manifested in these exhibitions together with a largely increased correspondence is an evidence of the appreciative interest in the work of the Station.

Very respectfully,

JAMES S. ROBINSON,

Horticulturist.

DEPARTMENT OF PHYSIOLOGY AND ENTOMOLOGY.

To Robert H. Miller, Director :

SIR :—In compliance with your request, I submit herewith a brief statement of the work of this department for the year 1894. The year has been notable, entomologically, for several exceptional occurrences, but as these will be treated of at length in a bulletin which will soon be issued, it will be unnecessary to go into details in this connection. Some of the insects already reported on in Bulletin No. 23, like the Tobacco Flea-beetle, the Melon Plant-louse, the Asparagus Beetle and the Harlequin Cabbage-bug, have attracted more or less attention and have been at work on the Experimental Farm. In 1893 brood xi of my chronology of the Periodical Cicada (*Cicada septendecim*) appeared in portions of St. Mary's and Prince George's counties, while last year brood, xii, also a seventeen-year brood, appeared in restricted localities. This is the insect popularly referred to as the seventeen-year locust, and, having paid particular attention to its larval habits, and its long underground life, I have brought together some interesting experience upon the subject in the report before mentioned. Various insects affecting the strawberry have been conspicuous and have interested Mr. Robinson, the Horticulturist. These will also be reported upon, and, particularly the Strawberry Weevil (*Anthonomus signatus*). A rather destructive scale insect on the grapevine, the *Aspidiotus uvæ*, has been noticed in other localities than those indicated in my last Report, and was quite bad at Riverside, in Charles County. The Pear Tree Psylla, (*Psylla pyri*), which has attracted a good deal of attention in the Eastern States of late years, and which does a good deal of injury, especially to young trees in the nursery, has been reported from Kent County, while one of the largest scale insects which affects the peach, viz: (*Lecanium persicæ*) has been the subject of some correspondence with Mr. John F. Ellison, of Lake Shore, Anne Arundel County.

Of all the insects which have been studied, however, the San Jose Scale (*Aspidiotus perniciosus*) is perhaps the most important, as it has been but recently introduced to the Atlantic Sea-board, and having been distributed from a celebrated nursery in New Jersey. It has been reported from, or observed in, Charles, Kent and Talbot Counties. It is one of the most injurious insects upon deciduous trees in California, and its advent in the East is much to be deplored. In order to prevent its further spread in the State, and with a view of familiarizing Maryland fruit growers with it, I have devoted more time and more space in the forthcoming bulletin to this than to any other species.

In accordance with my recommendation of last year, a cabinet carefully built after the most approved style of those in the National Museum has been finished, and I have been at work preparing a typical collection of Maryland insects to be preserved therein for study and comparison.

Considerable correspondence has been had on the subject of injurious insects, and a number of questions have been answered, species determined, and much information given in this manner.

In fact, the interest in the subject of applied entomology in the State of Maryland has increased since my limited connection with the Station, and I cannot but feel that you would be justified, from the importance of the subject, in increasing the allotment to the Department, so as to render it more effective, and particularly to add to the facilities for original investigation.

Having, on account of poor health, and for other reason, concluded last June to resign my position as Government Entomologist, and having been materially benefited in health by a trip abroad, I hope to be able to do more for the Station in future than I could do under previous arrangements.

Respectfully submitted,

C. V. RILEY.

REPORT OF PHYSICIST.

To Robert H. Miller, Director :

SIR:—The investigations of the soils of Maryland have been continued on much the same lines as in previous years. In the fall of 1892 opportunity was offered, in the preparation of a chapter on the Agriculture of Maryland for the World's Fair book, to make two visits to the Eastern Shore of Maryland, and to collect a lot of samples. This was the first opportunity for the study of the soils of the Eastern Shore. During the present year a large number of these samples have been examined as well as other samples from the limestone area of Western Maryland and the grass and wheat lands of Northern and Central Maryland. Much of the details of this work, especially of the mechanical analyses, has been done in a very satisfactory way by Mr. Sothoron Key. The details have been written up in the form of a bulletin entitled "Further Investigations on the Soils of Maryland."

I would again call attention, as I have several times before in previous publications of this Station, to the similarity of many of the soils of our pine barrens and our truck lands to the fine, bright tobacco soils of the South. In a bulletin on "The Soils of Maryland," I gave the mechanical analyses of a number of samples of these bright tobacco lands of the South and showed that they are almost identical in texture, and probably in physical properties, to the soils of our pine barrens and our truck lands. It has been objected that our truck soils are more valuable when used for trucking purposes, but any one who has any familiarity with the soils of Southern Maryland and with the trucking interest knows that trucking can only be carried on profitably near large cities and near adequate and rapid and easy means of transportation.

The truck products are so bulky and tender that they can not stand much handling, they have to be disposed of immediately, and have to be sent through to their destination on very rapid schedule time. There are large areas of land in Southern Maryland adapted to the trucking interest which are as yet too inaccessible and too far from any practicable means of transportation for profitable truck farming. I am very strongly of the opinion that many of these lands would produce a very fine grade of lemon-yellow cigarette tobacco, which has been so profitably produced in Virginia and North Carolina. It would, of course, involve considerable expense in the erection of curing barns, as the bright tobacco has to be flue-cured. There is, at the same time, some uncertainty as to whether the climate is adapted to the growth of that grade of tobacco, but as it is very successfully grown on similar soils in Virginia and in West Virginia, there seems to be little reason to doubt that it can be grown in Maryland. Where it is attempted, it should be tried on some of the typical truck soils which are too far from transportation lines to adapt them to the use of truck farming, and the experiment should only be tried upon soils which are identical in texture with the typical bright tobacco soils of the South. The Station would willingly make an ex-

amination of the soils for any one who proposes to undertake this work.

In our examination of the soils of the Eastern Shore we found that many of the soils of Caroline county have the same texture as typical truck lands, and they seem admirably adapted to truck growing. The principal crops still seem to be corn and wheat. With the present low price of wheat it seems a great pity that these lands should still be devoted to wheat growing when truck farming would in all probability be very much more profitable. There are two railroads in the Southern part of the county and a good steamboat service up the Choptank River. Much of the country could be very greatly benefited and improved by the extensive introduction of truck farming.

Many of the soils of the Eastern Shore differ from any of the other soils of the State, as they contain large proportions of silt and relatively little clay. They are similar in this respect to many of the soils of the far west. It seems to be a general experience with farmers, that soils made up of large proportions of silt and which owe their retentive properties to silt, rather than clay, are very difficult to maintain in a highly fertile condition. Such soils will not stand hard farming and neglect as a strong clay soil will. If they are neglected, or if improper methods of cultivation and cropping are employed, they quickly deteriorate, and when they have once "run down" they are the most difficult class of soils to improve. This is very noticeable on the Eastern Shore, where the social conditions and the conditions of labor have so changed within the last thirty years, and where the price of their staple crop, wheat, has so decreased. Much of the land has deteriorated and many of the farms have actually been abandoned. Lands which are said, a few years ago, to have been very fertile and highly productive, are to-day lying out as barren wastes, many of them as "white oak" lands with a close and impervious subsoil. These are probably the most refractory and most difficult soils to improve of any in the State.

Not only are these soils composed largely of silt, but the silt, itself, has peculiar properties, which account for the peculiar condition of the land. The silt as it is separated out from the soil in the process of mechanical analysis appears quite white and free from organic matter and from the oxides of iron usually found in healthy soils. The silt also falls together under water in a very compact, hard, and impervious mass, which is a very characteristic property of these soils.

We are endeavoring to study these silt particles, to find out of what they are composed and what are the peculiar forces which operate between their surfaces, which allows them to fall so closely and compactly together and gives the soil a cold and lifeless character. It is necessary to understand this before any intelligent methods can be suggested for the improvement of these "worn out" lands.

Yours respectfully,

MILTON WHITNEY.

FINANCIAL REPORT, 1893—1894.

Joseph R. Owens, Treasurer, in account with the Md. Ag'l Expt. Station.

1893.	SOURCES OF REVENUE.	DAY BOOK.	DR.
July 1,	To unexpended balance.....	14	\$ 3.95
1894.			
June 30,	To receipts from the Treasurer of the United States in four payments, per appropriation for the year ending June 30, 1894, under act of Congress, approved March 2, 1887.		15,000.00
1893.			
Aug. 2,	Check from Md. Ag'l College.....	14	94.33
1894.			
Apr. 23,	To sale of beef cattle.....	23	344.63
June 30,	To sale of produce.....	24	151.07
			\$15,593.98

1894.	NATURE OF EXPENDITURES.	LEDGER.
June 30,	By salaries.....	362 \$7,819.99
" 30,	" labor	365 2,040.38
" 30,	" freight and express.....	368 525.74
" 30,	" postage.....	369 34.81
" 30,	" printing and office expenses....	370 951.39
" 30,	" library and museum.....	371 169.00
" 30,	" tools and apparatus.....	372 411.06
" 30,	" buildings.....	373 590.21
" 30,	" supplies.....	374 1,570.10
" 30,	" exhibitions and meetings.....	375 209.09
" 30,	" feeding experiments.....	376 430.00
" 30,	" travel and board meetings.....	377 174.46
" 30,	" fruit experiments.....	378 150.00
" 30,	" tobacco experiments.....	379 123.68
" 30,	" unexpended balance....Day Book	26 394.07

\$ 15,593.98

We, the undersigned, duly appointed Auditors for the Corporation, do hereby certify that we have examined the books and accounts of the Experiment Station of Maryland for the fiscal year ending June 30, 1894; that we have found the same well kept, and classified as above, and that the receipts for the year are shown to have been \$15,593.98, and the corresponding disbursements \$15,199.91. Vouchers for the expenditure of this sum are on file and have been by us examined, and are found correct, thus leaving an unexpended balance of three hundred and ninety-four dollars and seven cents, (\$394.07) to be accounted for by the treasurer in the fiscal year commencing July 1, 1894.

(Signed.)

CHARLES B. CALVERT, J. P. SILVER,	} <i>Auditing Committee</i> } <i>Board of Trustees.</i>
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